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B.S.I. No. 1008

Most foundries possess very extensive data on various phases of production-control; a steel foundry, for instance, will possess a record of mechanical tests given by the various heats over a long period. Other types of foundries amass similar statistics, but are they used to the best advantage for quality control? Last Thursday the Hall of the Institution of Civil Engineers was packed to congestion to listen to a series of practical Papers designed to show the great benefits which can be derived from a proper statistical analysis of recorded data. How to set out diagrams in such a way that they will yield pointers for quality control is clearly described in British Standards Institution Specification No. 1008.* This specification, by the way, is of American origin, being virtually a reprint from one published by the American Society for Testing Materials. Put simply, the system is based on the grouping of results, usually in sets of five or six. A horizontal datum line is drawn representing the ideal or specified figure, and a series of horizontally disposed dots are inserted representing the difference between the basic and the ascertained figures. For those more mathematically inclined, and where conditions demand it, a second and slightly more complicated system is used. Having prepared this diagram, it is usual to average the differences so plotted and prepare a second similar graph, which obviously gives a better overall view.

Whilst the various Papers presented at the Conference to which we have made reference demonstrate the great advantages already accruing from the statistical control of quality, we will sketch a condition of its operation under foundry conditions. Thus, say, for two years, a firm has been manufacturing a type of casting and the diagram shows that the normal tolerance of scrap has been exceeded for three short periods, but that steps have been taken by the technicians on each occasion to return conditions to normal. Here, then, exists a background readily disclosed by the appropriate diagram, and coincidently its completion there of the drying up of a source of supply of raw materials, or change in labour conditions. This immediately focuses attention on the control sheet, for it will disclose the extent of impact of the new conditions on quality. The keeping of such charts gives an added interest to the rather drab existence of the testing room staff, and moreover the Government departments will withdraw wherever possible their inspectors, once they see that proper control diagrams are being kept. The origin of their present importance was their imposition by the American military authorities on manufacturers of a certain type of fuse; this was so beneficial that there has been an extremely rapid development, and one in which the foundry industry must participate.

A very important aspect of the statistical control of quality is that it provides a scientific basis for the proper specification of tolerances. Cases are instanced where specifications have been altered so as to align themselves with natural phenomena where, with necessary size of component, the tolerances can be stepped up or down to conform with observed results. This would be shown by all the dots locating themselves above or below the datum with undeviating regularity. We cannot too strongly advise all our readers who have to make continuously, or have long runs on, any one article to procure specification number 1008, for in it they will find the key to well-ordered production.

* Price 3s. 6d. from the offices of the Institution, 28, Victoria Street, London, S.W.1.

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JOBBING FOUNDRY EXPERIENCES

XXXV—By "Tramp"

Jobbing shops in common with all other foundries have their share of "wasters," and while in a large shop handling a greater quantity of a similar casting an occasional bad one is not of serious moment, the jobbing founder can ill afford to loose a casting, especially when the number off is only one or two and the margin between profit or loss is small. Consequently the jobbing founder exercises great care to avoid the dreaded "waster," but as so many factors are operating against him it is inevitable that occasionally a bad casting is turned out. When this occurs the founder, after ascertaining the causes of the defect and determining to avoid if possible a repetition in the future, considers the advisability of endeavouring to salvage the casting. The purpose for which the casting is to be used determines to a large extent if this is possible, as some jobs have not to conform to so high a standard as others. Many of the jobs produced in jobbing shops belong to the first category, and often ways and means can be found for passing the casting into service. One of these is to fill surface blemishes with some form of iron cement, but occasionally the defect is far too bad for this treat-

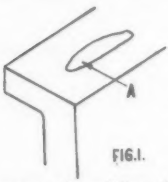

FIG.1.

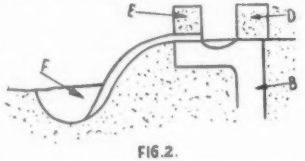

FIG.2.

ment when "burning on" is practised. This consists in first cutting out any sand or slag causing the blemish, and then burying the casting in a pile of sand until the surface to be filled in is perfectly level. Pieces of core are then built around the defective portion, and a flow off channel cut in the bottom of one of these and connected to a lower level in which the surplus metal may run. A coke fire is then built around the casting so as to raise its temperature gradually and get the casting well warmed through. After cleaning out any ashes remaining from the coke the job is ready to receive the metal, which is poured into the channel formed by the cores, and escapes through a slot in the bottom of one core previously mentioned. Sufficient metal is poured until the moulder feels with a piece of rod that the whole mass is fluid. Pouring is then stopped, any surplus on top drained out. The casting is left to cool gradually, and is subsequently subjected to the usual fettling operations and passed into service, a far cheaper method than scrapping and remaking. Figs. 1 and 2 illustrate a typical application, Fig. 1 showing the defect at A and Fig. 2 a section through the job assembled to receive the metal, B being the casting, D and E pieces of core forming the channel, the surplus metal being run through hole in core E into pit F.

Book Review

Workshop Practice, Vols. I, II, III, IV, VII and VIII. 2nd Edition. Edited by William Hatherton, and published by Sir Isaac Pitman & Sons, Limited, Parker Street, Kingsway, London, W.C.2. Price 7s. 6d. each net.

This series of handbooks has made itself popular with craftsmen and foremen, because it sets out in simple terms the underlying principles of their jobs, and the reviewer can well understand that a second edition has been called for. Some of the volumes, especially numbers III, VII and VIII, have been thoroughly revised. They cover the heat-treatment of steel and various engine fitting, erecting and testing jobs. Vol. II, which covers practical foundry practice, has not been subject to much revision; nor was there much need. Yet there are certain sections which required attention. For instance, the choice of the Rein cupola for illustration was never warranted, for it is doubtful whether half a dozen installations exist in the whole of the English-speaking countries. In fact, the reviewer had forgotten its existence, until this book called it to mind. Again, the initials "T. C." for the late Mr. J. E. Fletcher should not have been perpetuated in a second edition. Yet, when reviewing six volumes, it is a little unfair to pick out defects appearing in one section of one volume. The series has no pretention to serve the purpose of textbooks, but rather to inform the beginner about his own job or the shop executive about what happens before and after the processes for which he is responsible. Viewed from this angle, the series is eminently satisfactory. V. C. F.

AMERICAN MEDIUM TANKS

Mass production of a new M-4 medium tank for the American Army has begun at a new Mid-Western plant, states the Director of the Production Division of the War Production Board. Other plants now turning out M-3 medium tanks shortly will begin making the M-4. As other new tank arsenals come into production, they will begin with the M-4 medium models. Dates originally set for delivery of the first tanks from these new sources have been advanced considerably in order to meet the President's requirements of 45,000 tanks this year. The new medium tank will use cast steel and welded hulls to a much greater extent than the M-3 and a change in design will increase the effectiveness of its armament.

"**Metallurgical Literature.**"—In the discussion on this Paper by the London Branch of the Institute, reported in our last issue, Mr. A. J. Murphy, of J. Stone & Company, Limited, was inadvertently described, on page 246, as of the Institute of Metals. This designation should have followed Mr. N. B. Vaughan's name later in the same column. We regret this error occurred.

WEST YORKSHIRE SPECIMEN CASTING

III.—Discussion of Metal Used in Production

The February meeting of the West Riding of Yorkshire Branch of the Institute of British Foundrymen, held at Bradford Technical College (Mr. W. Fearnside, of Keighley, presiding), was devoted to the third of the series of discussions on problems arising in the various phases of work in producing a specimen casting of the type specified by the Council of the Branch. At this meeting, the metal used for producing the casting was considered by the opener, Mr. George Burgess, one of the younger members of the Branch, who remarked that the previous discussions (on moulding and core-making) had raised a few points of interest from a metallurgical point of view, one of which was rod-feeding. In view of the size of the casting and the time taken for it to cool, he considered rod-feeding was unnecessary. Again, the nature of the metal which must be used in order to satisfy the specification had a limited freezing range, and was very easily oxidised, and must therefore be poured as quickly as possible. The problem of porosity in the valve spindle guide, which represents the heaviest section part of the casting, was naturally a serious one. It should be possible, however, by the use of suitable metal to produce a solid casting without resorting to the use of chills or denseners. If this was found to be impossible, denseners were preferable to chills in order to avoid trouble in drilling.

Design and Composition

The question arose as to whether the design of runners and feeder heads for this job should be left to the moulder or to the metallurgist. From the point of view of the latter, the runners must be sufficiently large to take care of the relatively poor fluidity of the metal when compared with common foundry iron, and the feeder heads must be large enough to ensure that the heavy centre flange on which they are placed becomes solid before the feeder heads, and thus a supply of liquid metal was available to prevent internal shrinkage. Since it was impossible to put a feeder head directly on to the valve spindle guide, it should be on the centre flange, which is the largest outside section.

Turning to the composition of the metal to be used in this specimen casting, whether the output required was one, 25 or up to 200, Mr. Burgess suggested that in order to obtain test figures comparable with the specification, the casting must be of a good quality close-grained iron. Seen under the microscope, it should consist of small, well-distributed graphite in a matrix of pearlite or sorbite. The speaker then showed slides illustrating good and bad metal. To produce such a structure the total carbon content must be kept below 3.3 per cent., and as far as possible maintained between 3.0 and 3.2 per cent. If the total carbon rose much above that figure, the resultant casting would fail on tensile test owing to excessive graphite. If it was below, trouble would be experienced due to high shrinkage, high freezing temperature, short freezing range, poor fluidity, etc.

Silicon and Other Elements

The silicon content of the metal must be adjusted to the minimum amount required to produce a grey machinable casting, since if this amount was exceeded an open-grained and weak casting would be produced and also a greater tendency towards porosity. A suitable figure, he suggested, would be 1.7 to 1.9 per cent. silicon. Greater latitude in silicon limits was made possible by the use of a late silicon addition to the ladle in the form of ferro-silicon. Part of the silicon—0.5 per cent.—could be added in this way, and the total silicon content raised by 0.2 or 0.3 per cent., producing a better machinable casting without loss in physical properties. In a similar way, part of the silicon could be replaced by nickel in the proportion of 3 parts of nickel to one of silicon. The advantage of using nickel in this way was that the difference between the physical test figures on the 0.875 in. dia. test bar and the 1.2 in. dia. test bar was considerably reduced. A useful amount was an addition of 1.5 per cent. nickel with a decrease of 0.5 per cent. silicon. The use of nickel also introduced an element of safety in the regular production of high test figures.

Chromium might also be used in conjunction with nickel, the nickel being used to balance the extra hardness produced by the chromium, which was a powerful carbide stabiliser. He did not, however, recommend the use of chromium, since ferro-chrome was a troublesome alloy to dissolve in the ladle. It did not readily dissolve and might segregate, causing hard spots on the machined surface of the casting. Also, it should be possible to produce the required physical test figures with-

out resorting to the use of chromium. Molybdenum was also usable in connection with nickel. It had a similar action to chromium, but whereas the main action of the latter was as a carbide stabiliser, molybdenum improved the strength of the matrix. Ferro-molybdenum, like ferro-chrome, was troublesome to dissolve, and was better added as previously made high molybdenum pig.

Growth and Maximum Strength

Reference is made in the specification to growth, which is due to the breakdown by oxidation of free and pearlitic cementite into ferrite and graphite with a corresponding increase in volume. This decomposition is arrested by the use of carbide stabilisers, of which the best for this purpose is molybdenum. In an article on the growth of piston ring irons by F. Ballenrath and K. Bungardt, it is stated that "for periods of heating of 700 hrs., the temperature of commencement of growth lies between 400 and 450 deg. C." The composition of the metal being approximately: T.C, 3.8 per cent.; Si, 3.0; Mn, 0.8; P, 0.8; Cr, 0.1 to 0.5, and Mo, 0.3 to 0.4 per cent., and since it was unlikely that the temperature of 400 deg. C. would be reached in actual service by the specimen casting, it did not seem necessary to take steps to produce special iron to prevent this growth.

Maximum strength is obtained when the metal contained 0.3 to 0.35 per cent. phosphorus, and good physical test figures could be obtained with up to 0.6 per cent. P, but fell away very rapidly if taken beyond this figure. If this phosphorus content were used in practice, however, it was very likely that trouble would be experienced due to porosity in heavy sections, especially in the valve spindle guide which, from the specification, required to be drilled and ground and must be perfectly sound. Also trouble would be experienced from liquid shrinkage defects, the casting probably exhibiting a shrinkage cavity in the corner formed by the centre boss and the centre flange. In order to minimise these tendencies, the phosphorus content should be kept about 0.15 per cent., with 0.20 per cent. as the maximum.

In wartime, it may be desirable, owing to the necessity for conserving hematite pig-irons, to attempt to make the casting in relatively high phosphorus cast iron. If this was found to be necessary 0.6 per cent. phosphorus should be regarded as the upper limit. The total carbon content of the iron should be reduced by 0.1 per cent. for every rise of 0.3 per cent. P; the temperature of melting and casting should be raised, and the size of runners and risers increased. In order to reduce the increased tendency of the casting to chill, the silicon content of the iron should be raised, or if alloy iron were used, the amount of alloying agent should be increased with slightly more nickel to balance. A better way of utilising high phosphorus pig-iron would be to use it for making low carbon pig-iron or refined iron by mixing with steel scrap, and then re-melting this for making the casting. In this way 30 to 40 per cent. high phosphorus pig mixed with 60 to 70 per cent. steel scrap would produce a low carbon iron with 0.4 to 0.5 per cent. phosphorus. The S content of the iron should be as low as possible—0.12 per cent. maximum; and the Mn content sufficient to balance this, say, 0.80 to 1.0 per cent.

Melting Practice

For large or small quantity production the metal would be cupola-melted, and special care was necessary to ensure uniformity of composition and adequate tapping temperature. Existing plant governed the size of the cupola, but if possible this should not be large if only a small quantity of castings was required, because a small number of large-weight charges are more difficult to separate from charges of a different composition than a number of small charges. In any case, if large charges were used, these should be poured from two or more small ladles holding a maximum of 5 to 6 cwts. This enabled the moulds to be cast quickly without loss in temperature, two or more moulds being cast at the same time. If large ladles were used, the metal would probably be too cold to be of any use before the ladle was three-quarters empty.

The height of the bed-coke depended on the diameter of the cupola, but it should not be less than 36 in. above the centre line of the tuyeres, and for small cupolas higher than this, in order to produce the necessary high temperature. The charge coke should be sufficient to replenish the bed after each charge was melted. This amount should provide a 4 to 6 in. layer of coke in the furnace, extra charge coke being used if large quantities of steel scrap were used on the charge. The period of the blow used for these special charges was important owing to the danger of contamination with material of another composition. The best place was at the end of the blow, separated from previous charges by one or two charges of metal of a composition similar to that of the special metal. The next best position was at the beginning, when the same separating charges should be used to follow the special charges. This

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was important, especially when the normal run of irons used were high phosphorus and therefore quick melting.

It was advisable to charge first one or two charges of metal which were not required for important jobs, since the first charges in a day's blow were always the coldest and contained the largest amount of sulphur. The refined pig-irons previously mentioned could be conveniently produced in these charges. All charge constituents, including coke and limestone, must be weighed. The amount of limestone used should be adequate but not excessive, and of the order of 3½ lbs. per 100 lbs. of metal. This should be distributed evenly over the surface of the coke charge in the furnace before charging the metal, which should be charged in reverse order of melting—that is, steel first, scrap last. After the metal left the furnace, every care should be taken to prevent loss of heat. The ladles before use should be clean, if possible freshly lined; thoroughly dried and at red heat. They should be semi-covered, as the most serious heat loss was from the surface of the metal, due to radiation and drafts. Once the metal was in the ladle it should be poured into the moulds as quickly as possible. Cold alloy additions to the ladle also cooled the metal rapidly, and should be cut down to a minimum. Tea-pot ladles kept the metal free from slag, etc.

Metal Mixtures

It would seem rather wasteful to put on a special metal charge for a one-off job which involved the trouble of separating this from the rest of the charges. Iron such as was used for ordinary jobbing work would not, however, fulfil the physical test figures demanded by the specification, and it was doubtful whether ladle additions would produce the required physical properties. Even if these were produced it would not necessarily follow that the casting would be sound. Some attempt, therefore, must be made to alter the composition of the base metal previous to melting by the addition of a suitable percentage of steel scrap, ferro-manganese, ferro-silicon, etc., to bring it somewhere near the compositions already set out. In quantity production—200 off upwards—the use of special refined irons was justified, and was preferable to the use of large quantities of steel scrap in order to produce the required low total carbon content. Pig-irons with a tendency to large graphite such as hematite should not be used, as they tended to retain this characteristic even after passage through the cupola. Steel scrap might be used up to about 30 per cent. in the first mixture, but it should be possible to cut this down by using return scrap—runners, risers, machine-shop scrap, etc.—in subsequent mixtures. The segregation and use of these returns was most important from the point of view of economy and uniformity. The use of high steel mixtures tended towards lack of uniformity in carbon content, high sulphur pick-up, shrinkage troubles, etc. Also, the composition of all the constituents forming a charge should be as near the finished composition as possible after allowing for changes during melting. The manganese content of the iron should be adjusted to the required level by the addition of ferro-manganese to the charge before melting.

Metal Control

In quantity production of the specimen casting, frequent checks should be taken on the composition and structure of the metals used. This could be done by the usual methods of chemical analysis, micro-structure and physical test figures. Unfortunately, the results of these tests were only obtainable some time after the castings were made, and if these turned out wrongly, the only thing to do was to scrap the castings. Some kind of quick check, therefore, was required at the furnace before commencing to fill the moulds. This could easily be done by the use of small wedge test-pieces cast from every tap, quenched in water, broken, and the fracture examined. The amount of chill on the test-piece should then be measured, and for this particular casting, from the analysis given, would be 7 or 8 mm. This method of testing was particularly useful when using late silicon additions or nickel additions to the ladle, the amount of addition used being adjusted to produce the required amount of chill on the test-piece, thus eliminating variations in composition due to furnace conditions and in pig-iron weighing, etc.

Silicon Control

MR. JAMES TIMBRELL, SENR., said it might be difficult for the ordinary jobbing foundryman to carry out some of the ideals Mr. Burgess had mentioned, but the suggestions were very good and the effort would go far towards making a good job. He endorsed the utility of the wedge test, even though the small foundry owner would find interpretation difficult. Using charges of iron and steel scrap, or re-melt, to reduce the carbon was a good method, but it involved rather a high cost, though there was little alternative if low phosphorus and low carbon irons were desired. Could Mr. Burgess suggest any way of definitely controlling silicon

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ladle additions? What would be the loss from a 5 per cent. ferro-silicon ladle addition? What temperature allowance should be made to compensate for ladle losses?

MR. BURGESS, in reply, said the difficulty of the wedge tests was admitted, but to produce this casting regularly it was necessary to institute such a strict control. It was not so difficult to get the proper irons, as there was quite a selection now on the market. The wedge test should be used when silicon additions were made, and any later additions made would involve about 20 to 25 per cent. loss. It would reduce the temperature in large quantities, but on this job it would not be excessive. The pouring temperature should range from 1,200 to 1,400 deg. C., but it might reach 1,450 or 1,500 deg. C. It was doubtful whether success would be achieved under that temperature even though it may look somewhat high. There was the oxidation to consider.

Base Metal Preparation

In answer to a member, MR. BURGESS said when he mentioned 60 to 70 per cent. steel scrap for making a refined pig-iron he was referring to the blending with high phosphorus pig-irons. The amount of silicon in the pig would vary and be controlled by ferro-silicon additions.

MR. TIMBRELL suggested that alloy additions gave better results when furnace melted than when made as ladle additions, as a more homogeneous composition resulted.

MR. BURGESS agreed that such was possible, but pointed out that an initial attempt should be made to produce this casting without the use of any additions at all except ferro-silicon.

MR. S. CARTER said Mr. Burgess spoke of the high physical properties of a 0.35 per cent. phosphorus iron, and suggested that a 0.1 or 0.2 per cent. phosphorus iron would not be so good. Could he elaborate this?

MR. BURGESS said that it had been proved by many experiments in the past year or two that 0.3 to 0.35 per cent. P have definitely given the best results. He could not give a clearer definition at the moment as to why that occurred.

Small Sectioned Steel Scrap Detrimental

MR. S. WADE asked why in cupola practice small sectioned steel scrap was deemed to be detrimental?

MR. BURGESS suggested that the supposed trouble was due to the oxidation of the steel in passing through down the furnace, and he recommended that steel additions should be not below, say, half an inch thick.

In reply to a member, MR. BURGESS said in the case of this specification, aluminium flux would have a pronounced tendency to produce large graphite, and he would not advocate its use in this type of pressure casting.

Choice of Composition and Chill Elimination

A member asked whether on the composition recommended it was possible to get good test results without using a chill either on the outside or the inside of the job?

MR. BURGESS said it was a matter for trial, and if it was found inadequate then denseners should be used.

MR. H. FORREST said Mr. Burgess's point was that it was impossible to enumerate rules for making these castings without taking into account the many factors involved, and it was not easy to draw up a specification to cover all these points. If one could not overcome the difficulty by compositional control then use denseners, but if the iron gave the requisite properties without the use of chills, it was preferable. When dealing with a 200-off job it became a specialised job, and the foundryman was driven to using an iron of suitable composition, based on phosphorus irons available mixed with ferro-silicon or steel, or alternatively with 10 per cent. silicon pig-iron. There will be some sulphur pick-up on re-melting, but that can be neutralised by the use of a soda ash treatment in the ladle. The foundries who are making the 25-off are at the greatest disadvantage because they have not much margin for wasters if the practice had been wrong. The only way to tackle the job on those lines was to melt down a quantity of the steel and the high phosphorus iron and get a so-called refined iron.

MR. FORREST suggested test wedges be poured from a small ladle, and knocked out whilst red hot and left to cool until black and quenched. The wedges could be prepared within a minute, and showed visible evidence of the chilling of the iron and whether it was an open or close grain.

Graphite Control

MR. BALME said he was interested in the question of the correct distribution of the graphite. Could this be produced without any special alloy addition? On the matter of efficiency of the addition of alloys there were diverse views. He had made alloy additions at the spout and, when done carefully, he had had very good results, yielding a mixture which, if not perfect, at best approached perfection. On the matter of thin sectioned steel

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additions—quite often received nowadays—he felt that that was an argument in favour of the use of refined pig-iron. Sections of 5/8ths, etc., were more suitable than cubes of 2 in. square.

MR. BURGESS, in reply to Mr. Balme's first question, said he thought this should be possible. The higher the carbon the higher the graphite and the more of it. In regard to alloy additions at the spout, personally he would add all at the spout except ferro-manganese, if used. As to the steel scrap, he was fully in favour of using a 3/8ths or half inch plate if it was in lengths of, say, 5 in. or so across.

MR. STOTT said in regard to refining of graphite, recent American research came to the conclusion that graphite was not affected in size by the additions, but merely by the cooling.

MR. BURGESS agreed that the main influence on the graphite is the rate of cooling.

MR. S. W. WISE said Mr. Burgess had given his experience based on conditions in which every possible control was enforced, but in many of the foundries 1,450 to 1,500 deg. C. was a rather high temperature to attain, and many of them, he felt, would like to know how they could get it. As to steel scrap, he doubted if there was any risk in using small scrap. He used much of it for certain work in the last war period and never had any trouble. He did not favour aluminium additions.

MR. BURGESS said the high temperature involved, *inter alia*, blast volume control. He agreed with Mr. Wise as to aluminium additions.

The BRANCH-PRESIDENT said in the course of discussions on the production of this specimen casting from the foundry point of view there had been many references to both internal and external chills. Mr. Burgess apparently did not favour this method much, yet as a safeguard one would be justified in using some chilling method around the inside of the casting, especially in the 25-off job.

MR. WALKER (Leeds) asked whether Mr. Burgess would recommend an addition of calcium silicide.

MR. BURGESS said it could be used to make a casting grey if it tended to be white.

Metal and Riser Elimination

In reply to a member who asked whether the metallurgist could make up a metal which would do away with feeder heads and therefore avoid a good many of the difficulties arising out of the use of feeder heads, MR. BURGESS said he did not think it likely that a casting could be made to meet the requirements of this specification without the use of a feeder head, and moreover he would advocate that the feeder head should be large.

The BRANCH-PRESIDENT pointed out that with a large variation of section one could not possibly use any one type of iron for any and every job, and it was necessary to use methods, even an old-fashioned one like chills, rather than experiment with a fancy iron at risk of losing the job. That, at any rate, will be the feeling of the average foundryman who cannot afford wasters.

MR. BURGESS said his point was that it would be difficult to use a chill on a job like this to get at the seat of the trouble.

MR. S. CARTER said there seemed to be an impression in the meeting that this would be a very difficult job to make, but that was not so. It could be produced without any risers at all, though he favoured the use of chills.

MR. BURGESS said his object was to do without chills. He proposed a compromise, when a member suggested, purely from the point of view of soundness, the use of a pressure head instead of a taper head.

High-Temperature Melting

MR. TIMBRELL, referring to the 1,450 to 1,500 deg. C. temperature, which he considered rather high, remarked that Mr. Burgess would seem to be very fortunate in his light scrap supplies, from which one can get a very high temperature, but it was not so easy with heavy scrap; yet one had to get rid of the heavy scrap somehow or somewhere.

MR. BURGESS agreed that foundries had to use up the heavy scrap, but why not employ it on some job that did not require the high temperature?

Vote of Thanks

MR. S. W. WISE proposed a vote of thanks to Mr. Burgess for opening the discussion, the proposal being seconded by MR. CARTER.

Temperature-Indicating Sticks.—Tempil Corp., New York, has announced a new form of their product, called Tempilstik°. These temperature indicators have a specified melting point and are available from 125 to 1,600 deg. F., in convenient temperature intervals, and are said to have a mean accuracy of within 1 per cent. of the temperature stamped on each stick or pellet. Thus a 300 Tempilstik° drawn across a surface heated to less than 300 deg. F. will leave a chalk-like mark, which melts sharply into a liquid streak when the surface reaches 300 deg. F. This method of temperature determination provides a simple and convenient method of signalling desired preheating temperatures in the welding of steel, special alloys, cast iron and non-ferrous metals.

INSTITUTE OF BRITISH FOUNDRYMEN

Notes from the Branches

Falkirk Section

The annual general meeting, which was well attended, was held in the St. Francis' School, Falkirk, on March 28. Mr. Thos. Tyrie, B.Sc., presided. The business meeting was followed by the presentation by Mr. W. W. Braidwood, Renfrew, of his Paper on "Some Experiences with Cupola-Melted High-Duty Irons," which will shortly be printed in our columns. The following were elected by the members to the various offices for session 1942-43:—

President: Mr. Geo. C. Wilson, Camelon.
Senior Vice-President: Mr. John S. Kidd, Camelon.
Junior Vice-President: Mr. R. R. Taylor, Larbert.

Committee: The following gentlemen were appointed to fill the three vacancies caused by automatic retirement of previous members:—Mr. Joseph Hobkirk, Falkirk; Mr. Edward Cunningham, Stenhousemuir; and Mr. William Montgomery, Leven.

Mr. Thomas R. Goodwin, Bonnybridge, was unanimously asked to carry on the duties of secretary and treasurer of the Section.

The secretary reported on the session's activities, which were deemed to be an unqualified success, considering the additional call on the time of all members.

Lancashire Branch

The annual meeting of the Lancashire Branch was held at the Engineers' Club, Manchester, on April 11, Mr. W. Holland presiding over a very large attendance of members.

The HON. SECRETARY (Mr. A. Boyes, Manchester), in his report, stated that the Branch had had a highly successful year, and that it had been possible to complete the programme as scheduled. Attendances had been, in every instance, well up to the pre-war standard and in some cases above it. During the past year, 23 new members had been elected to various grades of membership, and three members who had attained the age of 65 years, and had been members of the Branch for over 25 years, had been granted life membership. The Burnley Branch had had a very successful year. As this would be the last time he would have the opportunity of presenting an annual report to the Branch in the capacity of honorary secretary, he wished to thank the members for the consideration they had always shown him, and also to express his most sincere thanks to Mr. Holland, the President, under whom he had served for the past two years, as well as to the members of the Council, and to Mr. Bolton, the acting secretary of the Institute, all of whom had been most helpful to him in assisting him to carry out the duties of his office.

The report having been adopted and the secretary thanked for his services, a vote of thanks was accorded the retiring officers. MR. A. PHILLIPS (Manchester), in proposing this, said the President and Council had rendered yeoman services to the Branch during the past year. The members were extremely sorry that during the period of Mr. Holland's presidential term of office it had not been possible to hold an annual dinner. After MR. J. JACKSON had seconded, MR. W. HOLLAND (the retiring President) said it had been a great pleasure to him to preside during the past two years. He had been able to attend all the General Council meetings of the Institute and the Branch meetings with a deep sense of gratification. There had never been an attendance of less than 60 members at any of the Branch meetings held during the previous two sessions, and the present one far exceeded that number. He then proposed that Mr. E. J. L. Howard (Manchester) be elected to the office of President of the Branch. Other officers elected were:—

Senior Vice-President: Mr. A. Hopwood (Liverpool).
Junior Vice-President: Mr. S. Brooks.
Members of Council: Mr. A. Jackson, Mr. R. C. Hargraves, Mr. G. C. Studley, and Mr. J. A. Reynolds.
Representatives on General Council: Mr. A. Phillips, Mr. J. Jackson, Mr. A. L. Key, and Mr. W. Holland.
Hon. Auditors: Mr. A. Hopwood and Mr. R. R. Hargraves.
Hon. Secretary: Mr. H. Buckley.

LABOUR DILUTION IN AUSTRALIA

Regulations to govern the principles and procedures for the dilution of skilled labour in the sheet metal, metal moulding, and electrical trades in the Commonwealth of Australia, were made in October, 1941. The Regulations for each trade incorporate the principles of agreement formulated after discussions with the employers and workers in those industries. The Metal Moulding Trades Dilution Regulations, for instance, contain further principles of agreement between the employers and workers in the industry in a Schedule attached to the Regulations. It was agreed that:—(1) Labouring work now performed by moulders shall be performed by assistants; (2) employers are to be urged to take their full proportion of apprentices in foundries where proper facilities for learning the trade are available; (3) wherever practicable, jobbing moulders and/or core-makers now doing plate and/or machine moulding and/or core-making shall be elevated to jobbing work and an opportunity shall be given to plate and/or machine moulders who were apprenticed to learn jobbing moulding in Victoria to work solely on jobbing work; (4) the parties should endeavour to have a more equitable distribution of defence work amongst the States, thus avoiding a shortage of labour in one State and a surplus in another State; (5) the parties will endeavour to make foundry conditions safer for working by introducing safety schemes and by making employees comply strictly with Federal and State factory legislation and/or awards; (6) the parties will endeavour to get all foundry workers on the reserved list of occupations, and (7) the parties will take steps to bring back into the industry, wherever possible, men who have retired from the industry or from Government service.

A TECHNICAL DEPARTMENT FOR THE SMALL AND MEDIUM CASTINGS FOUNDRY*

ORGANISATION AND FUNCTIONS OUTLINED

By H. Hayden

In the majority of engineering concerns to-day a planning and technical department is employed with considerable success, and a similar department would be well worthy of consideration by the foundry industry executives in the near future, particularly in view of increased production arising from the introduction of partial or complete mechanisation. Greater production usually means new problems arising, with the result that serious losses can be, and are being, sustained by foundries through lack of foresight in preparation of the necessary equipment to meet the demands of this production.

The work of this new department would be to study all phases of manufacture, and act as collaborator between all processes. It may be said that co-operation already exists between departments, such as the foundry and patternshop, but the author would venture to say that there are not a great number of foundry executives who can visualise the complicated casting to be produced from a blueprint. For instance, it is common practice for the foreman patternmaker to use his own discretion regarding the production of the pattern equipment.

The efforts of the foundry to produce sound castings by the use of tie-bars, chills and feeders, etc., often cause a great amount of trouble to the finishing departments, which could have been avoided had consideration been given to this matter when the layout was being planned.

Personnel and Functions

The personnel of the proposed technical and planning department should have a wide range of experience in foundry practice, having served in most of the departments, such as patternshop, inspection department, foundry and coreshop, and should be capable of reading a blueprint to a high standard. If it is not possible to acquire personnel with such varied and extensive experience, a combination of men, each one being a specialist in the work of one of the above departments, could be employed.

The blueprint of the casting required should be studied and visualised from the points of view of all departments concerned, and it should be decided which is the most successful method of moulding. It may be essential for the designer to be contacted, and have explained to him any modifications to the design of the casting which would facilitate manufacture. Here again it may be stressed that co-operation is already being enacted, but the author would say that in the majority of cases it is only because it is essential to overcome difficulty experienced on actual production that he is consulted.

It has been the author's experience to note two different designs of castings which were used for the same purpose. One was a simple form and the other a very complicated design, which, due to moulding difficulties encountered, was giving a very high percentage of scrap. The author would say that if the designer of the latter casting had been consulted regarding these difficulties, the simplicity of the former could have assisted in overcoming the difficulties which existed on this particular casting. After reaching an agreement with the designer and proving that the modifications will have no detrimental effect on the casting, the next stage of production should be considered.

Requirements of Patterns

The method of moulding has already been decided upon, and the pattern equipment is prepared. The following are some of the points which should be carefully noted:—(1) High standard of accuracy to be maintained at machining location points; (2) should extra strength be given to ball race seatings, small bosses and facings to counteract any core misplacement, offset on castings or slight machining adjustment which may be necessary, and (3) pattern sizes to conform to varying metal contractions. This is a matter to be decided by experience.

After the completion of the pattern equipment, it should be decided:—(1) If gauges will be required to check cores before and after assembly in the mould; (2) the best method of supporting the core; (3) if any core distortion will occur arising

* The winning entry for a Short Paper Competition held by the East Midlands Branch of the Institute of British Foundrymen. The other two papers are reproduced on subsequent pages.

Foundry Technical Department

from the method of drying; (4) will coreboxes require holes drilling through any particular section to assist coremaker in venting the core, and (5) the positions of core irons.

Preparation of Mould

A mould is prepared; any discrepancies noted and arrangements made to remedy them. Care should be taken to standardise the position of all runners, risers, tie-bars, chills and feeders, etc. These should as far as possible be placed where they will not interfere with machining locations, points of contact for setting, at the same time performing the work for which they are required. It should be noted whether a good lift was obtained when the pattern was withdrawn and when placing cores in the mould, if these required easing slightly.

The moulder who makes the first sample casting from new pattern equipment may make an entirely satisfactory casting, although he has had to overcome several snags which arose, but when the production man commences work, the same results cannot be maintained, because he has not the necessary skill and time. A personal experience illustrating this point was the core for a pull-pin-box casting. This core formed a 1¾ in. dia. hole with a chamber at the top, which gave a wall thickness on the casting, and it was held in position by a tapered coreprint 1½ in. deep. No allowance had been made for this taper in the corebox, and when the moulder placed the core in the mould, it crushed very badly due to this discrepancy. To overcome this, he had filed the core to fit, and this, together with core misplacement, was the cause of the ⅝ in. wall thickness, being ⅛ in. oversize. If gauges had been prepared for checking the core position, after assembly in the mould, and observation made during the preparation of the first mould, material, time and trouble would have been saved.

On the finished casting, all defects should be noted and arrangements made for their elimination. Gauges should also be made for the use of the inspection department. In these days, when the foundry industry is called upon for castings within close tolerance of drawing dimensions, the author feels sure that this new department would not only improve the standard of castings produced, but would save unnecessary labour and wasters.

In conclusion, the author agrees there is at the present time a certain amount of co-operation, but a good deal more is needed, especially with the less highly skilled labour employed on a mechanised plant producing high-quality castings.

DISCUSSION

MR. W. T. EVANS, after congratulating the three authors on their work, said that when he was a young man he was always told that careful attention to details was the key to success, and he was convinced that that was what these authors were doing. Apparently they were all studying their job, and making a success of it. The keen details shown in all the Papers was rather surprising, and if the authors only continued in the way they were going, they would make good foundrymen.

MR. W. H. SMITH said that, personally, he was disappointed that Mr. Hallamore's Paper was not the successful one. Mr. Hayden's recommendations were beyond the means of a small foundry, as by the time a committee was formed, the profits would soon be absorbed. It was safe to assume that in most foundries one did not rely upon a technical department. In a works where there was a good foundry manager, core-shop foreman and patternshop foreman, very good castings were made which suited the customer, and although the author's ideas were very good, they would only be successful in a large-scale firm, and were not applicable to the industry in general. In many cases one man did several jobs. In the event of a committee being formed, as someone had to make the final decision, who would control it?

MR. HAYDEN, in reply, said he quite agreed that a technical department was especially applicable to large foundries, although it would only be to a slightly lesser degree successful if applied to medium-sized foundries. Agreement should be reached by collaboration without resorting to the decision of one individual, except very exceptionally.

Better Technical Education Needed

MR. J. ROXBURGH commented on the general aspect of the winning Paper, the title of which could perhaps have been better chosen. The author referred to the introduction of a technical department, but in most foundries of any size, planning and production departments were normal, and there was no reason why technique should be limited to any one particular department. In fact, it would be much better if technical education became more widespread in foundries. Following on from planning and production of jobs, the very important question of inspection should be given consideration, and inspection should be carried out at as many stages as possible.

Foundry Technical Department

MR. HAYDEN said, in the majority of foundries, it was left to each department to perform their individual part of the work, although some aspects of other processes were generally considered. He agreed with Mr. Roxburgh as to inspection, but just as much attention should be given to the planning, as errors caused were mostly a liability on the foundry.

Planning: A Relative Matter

MR. A. E. PEACE said that the question of planning was to some extent a matter of degree. In every foundry, whether it be small or large, there was some planning to be done, otherwise the job could not be made. Mr. Hayden was preaching a gospel that in a works where repetition work was being handled in big volume, the planning which may at present be done by the works manager or foundry manager, or by mutual co-operation, ought to be carried out by other personnel in a separate department. This sort of thing was in existence in many large firms in America, where he had seen it carried to an extent which he would not like to see in British foundries. For example, they might first decide how the casting was to be fettled, and let that govern the moulding considerations. With castings where the fettling costs were very much higher than the foundry costs, that may be satisfactory, but this was not always the case, and therefore he felt that this matter needed to be governed by the exact class of work to be done. It was quite possible for this separate planning idea to cause unnecessary expense, and perhaps yield no advantage. He appreciated the possibilities in cases where, in addition to ordinary fettling, there were various finishing operations on castings after they had left the foundry.

MR. HAYDEN said, if this department were introduced in a large foundry, it would not be carrying out activities at the expense of the works or foundry manager. Where hundreds of different types of patterns are being used daily, it would be agreed that the management could not devote their attention to each individual case. The practice of allowing the fettling operation to govern the moulding considerations in Britain or America was not followed to any great extent to his personal knowledge.

No doubt Mr. Peace would appreciate that from the beginning of the war there had been a noticeable increase in the number of coining operations on castings. This had necessitated castings being produced to much finer limits than when machining operations were employed, permitting castings being produced to a tolerance of + or − 0.062 in., as coining operations demanded castings within a limit of + or − 0.005 in. The expense incurred by this planning was somewhat counterbalanced by the fact disclosed that these duties must be carried out somewhere.

MR. HALLAMORE said Mr. Hayden's remarks about the technical committee sounded very nice on paper, but, unfortunately, moulders' troubles were not overcome so easily in practice. Jobs pass into production, and often run smoothly at first, but troubles arise afterwards, necessitating alterations of the original method. Finally, does the foundry foreman have anything to say on this committee?

MR. HAYDEN replied that discrepancies which arose in production were generally of a small character, except in isolated cases, and the person with knowledge of foundry practice in the technical department should deal with any problems concerning the foundry in conjunction with the foundry foreman.

Qualifications of Planner

MR. E. HOLLAND said that there was one point with which he did not agree. Mr. Hayden had stated that, should one man having an expert knowledge on all subjects not be available, a specialist on any one subject should be chosen. If this man was, say, a moulder, how was he going to decide how the pattern was to be made initially? The cost of the pattern to suit his method of moulding may exceed that of the whole order for castings. Therefore, he did not see how one man could fill the post unless he had been through all the departments.

MR. HAYDEN pointed out that Mr. Holland seemed to have misinterpreted the paragraph concerning the requisite personnel. The gist of the suggestion was that the personnel should have a wide range of experience in foundry practice, having served in most of the productive departments, such as patternshop and foundry, etc., but if they were not available, then a combination of men, each one being a specialist in the work of one of the above departments, could be employed.

MR. R. ROGERS said that, judging from the experience required, there appears to be no retiring limit for the personnel of the technical staff suggested by Mr. Hayden. He feared the staff would be very old men before they learnt all that was necessary.

MR. HAYDEN, in reply, said he did not think any difficulty would be experienced in staffing this

(*Continued on page* 14.)

CORE SHOP METHODS*

From the Foundry Aspect

BY J. C. HALLAMORE.

The idea of this Paper originated from a remark made by a lecturer at a recent meeting of the East Midlands Branch, the remark being that "it was the job of the core shop not to make cores, but to produce good castings." Having this idea in mind, the Paper is a criticism of core shop methods as seen from the foundry.

Much of the work is on a piecework basis, as in the foundry, the difference being that moulders are not paid for scrap castings, with certain exceptions, even if resulting from bad cores, whereas the coremaker is paid for poor or indifferent cores that may cause scrap castings. Many cores burnt or not fit to put into moulds are sent to the foundry. It may be agreed that these should not be used, but a moulder who has to produce a given number of castings, or may be waiting for boxes to be freed, can be excused using some of these cores and hoping for the best. Stricter supervision is required to ensure that only good cores reach the foundry and that core shop production is ahead of that in the foundry. All delays of casting of moulds and waste of moulder's time can then be avoided.

Cores removed from continuous drying stoves by conveyor, or whatever type of stove is used, are then handled by female labour, the heavier cores being left for the men, and are then stored to await the requirements of the foundry. Here is where some of the trouble lies, either some of these people do not care or have not been instructed as to what cores are fit for use and those which are not, or any that may require a coat of blacking. This is where inspection is needed, as after cores are stacked or put on shelves, bad cores are soon covered up, and not seen till required by the foundry, thus causing delays.

It is the practice in some shops for all cores to have fins removed, vents cleared, and in the case of larger cores to be assembled in jigs and sent to the foundry ready to drop straight into the moulds. This should be done in all shops. Why are moulders expected to waste production time going to the core shop to find and fetch their own cores; should not the core shop deliver them to the foundry? Other departments such as fettling and sorting have all castings brought to them, as do all other departments that handle castings. Moulders fetching cores can easily take wrong ones by mistake, or if short of the correct cores can frequently utilise others not intended for them, thus leaving someone else short. Core shops which have their own labourers know, or should know, the requirements of the foundry from day to day, so why should they not deliver their own production as all other departments have to? Moulder's time would be saved at the cost of labour, and thus increase production. If core shops do not deliver the cores to the foundry, then moulders could easily be issued with a ticket bearing the job number, on presentation of which they should receive the required cores without any waiting about.

In conclusion, it is hoped that these remarks will not be taken as destructive criticism aimed at the core shop, but a small effort on the part of the author to bring the two departments towards a more amicable understanding of one another's difficulties.

* An entry for a short Paper Competition organised by the East Midlands Branch of the Institute of British Foundrymen.

A.F.A. AWARDS

The American Foundrymen's Association announced the following awards at the First Western Hemisphere Foundry Congress and 46th Annual Convention, held in Cleveland, April 20 to 24:—The J. H. Whiting Gold Medal to A. L. Boegehold, chief metallurgist, General Motors Research Laboratories, Detroit; the John A. Penton Gold Medal to John E. Galvin, president, Ohio Steel Foundry Company, Lima, O.; and honorary life memberships conferred on Patrick Dwyer, engineering editor, The Foundry, Cleveland, O., and Roy M. Allen, consulting metallurgical engineer, Bloomfield, N.J.

Mr. Boegehold is noted for his extensive and valuable research work in the field of cast iron and malleable iron, and has for years been prominent in the work of the A.F.A. and other American societies. At Detroit he has directed numerous research projects on iron and steel, non-ferrous parts and powder metallurgy, used in automotive production. The award to Mr. Gavin is being made in recognition of his assistance to other foundrymen in co-operating in bettering steel casting production. Mr. Patrick Dwyer has for the past 23 years been engineering editor of "The Foundry." In addition to many technical articles dealing with practically every phase of foundry practice, he is the author of "Gates and Risers for Castings." Mr. Roy Morris Allen is recognised for his delivery of the Association's first lecture course on the fundamentals of the use of the microscope in grey-iron foundry practice, which have been published as "The Microscope in Elementary Cast Iron Metallurgy."

Hardenability Tests.—A selected bibliography of literature on hardenability testing, over the period 1924 to 1941, is given as a supplement to an article on the S.A.E. Standard Hardenability Test for Steel, published in the January issue of the Journal of the Society of Automotive Engineers.

RUNNING AND FEEDING MALLEABLE IRON*

BY E. HOLLAND.

It is not intended in this Paper to discuss the chemical analysis of malleable iron, be it whiteheart or blackheart, but to discuss its behaviour and peculiarities as viewed from the foundry floor, particularly regarding the liquid shrinkage and solid contraction of the metal. As is well known, malleable iron must be white in the as-cast state, but to attain this in light and heavy sections, together with sound castings free from tears, pulls, cold shuts and blowholes, presents difficulties that are experienced by no other class of foundry.

Feeding

If sufficient consideration is not given to the position of the feeders, their height, weight and size of the mouth adjoining the casting, then defective castings will result. Owing to the heavy liquid shrinkage, thick sections must be either fed or chilled. Both may be used, but such practice is not advocated.

The height of the feeder must be greater than the portion of casting to be fed, and if this is not done, there is a danger of the casting feeding the feeder. The mouth should be large enough to remain liquid until the casting has set, the feeder itself being the last to solidify. If the mouth be too large, the upper part of the feeder may solidify first, and so make the liquid level below that of the casting. The main object is that the liquid level of the feeder must keep above that of the casting throughout the solidifying range. When two or more feeders at different levels are placed in proximity to each other, then the upper one will feed the lower, and a pipe hole will appear at the mouth of the upper.

Where two or more heavy sections are joined by a thick section, one feeder suitably placed will usually feed them, but when they are joined by a thin section, one feeder will not be enough, as the thin section naturally interferes with the feeding of both, each heavy section having to be either fed or densened. A feeder must be placed where hot iron enters the castings owing to the fact that the upper portion receives the first rush of cooling iron under pressure of pouring, and this sets while the lower portion is still liquid. The lower portion now sets, the runner mouth being the last to do so, and a draw or unsound spot would occur here if a feeder were not placed to counteract it. Top feeding gives more pressure of feeding, due to vertical pressure, and, generally speaking, is the best method to employ, although feeders need to be larger due to exposure to the atmosphere.

Denseners

Feeders and denseners are somewhat related, both aiming at the same result, namely, that of rendering the thick section sound. The feeder attains this by gravity, forcing more metal in to make up for the loss of volume during the transition period between liquid and solid. The densener works in the opposite sense, evening out the cooling rate by cooling the thick section quickly, thus preventing crystal growth and formation of graphite.

There are isolated cases where a side feeder is impossible, and a large enough mouth could be placed on a top feeder. In this case, the bottom portion may be densened to shorten the apparent length of this section by progressive solidification. The danger, ever present with denseners, is that they are liable to cause blowholes if any moisture be present. In greensand this is often a problem, but some success may be obtained by coating them with core oil and coal dust, plumbago or clay wash. These all have one object, not to prevent moisture from forming, but to insulate the denseners from the first rush of hot iron, and also to make them refractory. Hot iron must not be allowed to pass over a densener to reach another thick section, as unsoundness will develop in the latter. Where denseners are placed in the top, the casting will contract away from them, and contact will be lost, although, on the other hand, there is less risk of blowing off, as the hot air rising dries off the moisture before the iron reaches it.

Hot Spot Porosity

A common trouble is porosity at the junction of an angle, and this can be due to two factors, namely, "too much fillet" or "not enough." If "too much" is the cause, an unsound spot occurs in the centre, whilst with "too little" the re-entrant angle crystal formation causes a zone of weakness at the inner angle, usually in the form of small cross-sectional pulls. The remedy for the former is red sand rammed around the angle, which will densen the inside angle, as red sand holds more combined water and consequently cools quicker. In the second case it is obvious that some increase of fillet will assist the metal to flow round the corner, and so solidify the inside angle.

* An entry for the Short Paper Competition held by the East Midlands Branch of the Institute of British Foundrymen.

Running and Feeding Malleable Iron

Feeders

Where a feeder is attached to a casting, a tear may occur due to the feeder retarding the rate of cooling at the mouth. The remainder of the casting having fully set, the mouth now begins to set and contract, and a fulcrum has formed near this part; thus contraction continues in the casting, but the weak mouth is levered apart. A fin of metal or a tie stretched across this point will strengthen it in two ways. By cooling in the same way as a radiator fin and by the fact of being the first to solidify, it holds the two together.

The solid contraction between two feeders will sometimes cause them to be pulled almost right off to the detriment of the feeding of the casting. This occurs particularly in jobs where feeders are of nearly straight design, or where the moulder's tubes run straight through to the top, thus holding the feeders too rigid. It can to a great extent be avoided by tapering feeders and tubing on an angle away from the casting.

Coal dust can cause a great amount of trouble owing to the short life of the metal, its effect being most marked in thin section work. When used excessively, thin sections are made still thinner by gas pressure, and a column of gas escaping in the top may prevent two streams of metal from uniting, thus resulting in a cold shut. This is often blamed on to sluggish iron.

In such a short Paper as this, it has only been possible to skim the surface. Such points as dummy risers, dummy feeder, skimming gates and the effect of synthetic sand have had to be omitted.

In summarising, it does seem that the moulder's work is one of contradiction, for he must ram his sand hard enough to stand hundredweights of pressure, but weak enough to give at the least pull of contraction. Put coal dust in his facings to create a gas pressure and then vent to allow it to escape. Then, again, feeders must be put on to keep it hot and chills to cool it, and large mouths put on feeders to keep up a supply of molten metal, and reduce them to prevent the castings from being the last to solidify. Fillets must also be inserted in corners to stop them pulling and taken out again to make them solid. What then can he do but make a good casting, and break it up to see if it is satisfactory?

High-Speed Steel Reclamation.—Please tell your men handling steel scrap for remelting that if they should find some end bits of steel obviously heavy in relation to their mass to put it on one side for further examination.

A TECHNICAL DEPARTMENT FOR THE SMALL AND MEDIUM CASTINGS FOUNDRY

(*Concluded from page* 11.)

technical department with other than old men. With the advantage of the technical training which is available at the present day, men who have not even reached middle age could be found who possess the necessary qualifications. He, personally, had met young men in engineering establishments serving in a similar type of capacity.

Vote of Thanks

MR. RADFORD, who proposed a vote of thanks, referred to the title of the Paper, and wondered whether the author meant "Small and Medium Foundries" or "Small and Medium Casting Foundries."

MR. JOYNES, who seconded, said he could not possibly understand how the pattern equipment for the pull-pin-box casting was passed into production.

MR. HAYDEN, when acknowledging, said the suggested department would function in foundries producing small and medium castings, and assured Mr. Joynes that the pattern equipment had been used for the production of these castings in the manner stated.

DESIGNATIONS FOR CASTING ALLOYS

To extend their standard system of type numbers introduced some years ago by the American Iron and Steel Institute for wrought stainless steels, the Institute recently issued, in "Metal Progress," a similar concise and flexible system for casting alloys, worked out by the Alloy Casting Institute. All designations begin with the letter C or H, indicating whether the material is of the corrosion- or heat-resisting class. The second symbol arbitrarily represents the nickel and chromium ranges, the nickel percentages increasing in amount from A to Z. In the case of corrosion-resistant alloys, a number follows the first two letters and represents the maximum carbon content in hundredths of 1 per cent. These numbers are omitted in the general designations of heat-resistant compositions; in them, carbon may be indicated, if desired, by adding a number to the symbol, to represent the middle of a ten-point carbon range. If special alloys are also included in the composition, they are indicated by the addition of a letter or letters to the symbol. For example: CF-7MC represents a corrosion-resistant alloy of 8 per cent. to 10 per cent. nickel, 18 per cent. to 20 per cent. chromium, with 0.07 per cent. carbon max. and with molybdenum and niobium additions.

American Metallurgical Scene—8

HEAT-TREATING TANK HULLS AND TURRETS

The method of firing utilised by a leading American producer of steel castings, to perform the complex sequential heat-treatment of the new one-piece cast alloy hulls and turrets of large (60-ton) and medium (29-ton) U.S. Army tanks, has just been disclosed, says "Heat Treating and Forging." The Selas Company, Philadelphia, was recently awarded the contract for some fourteen giant furnaces (mostly continuous) in multiple batteries—all direct-fired by gas through a multiplicity of individually adjustable ceramic radiant cups. "Pilot" operations leading up to the contract have involved six similarly direct-radiant-gas-fired units up to 82 ft. long by 11½ ft. wide—some using as many as 104 radiant cup burners distributed over furnace sidewalls to achieve the required "planned distribution" of heat and high rates of "direct heat transfer."

The outstanding features of the furnaces are associated with the severe specifications covering heating uniformity and zoned full-proportioning control. Temperature variations which, in normal heat-treating practice, would be considered as insignificant, would, in the case of the new cast armour plate, produce non-uniform and unacceptable armour. The difficulty of meeting such specifications is augmented by the fact that individual hull castings for the new 60-ton tanks may weigh as much as 25,000 lbs., be as large as 22 ft. long by 10 ft. across, and vary widely in contour and cross-section at various points. An overhead monorail conveyor system above the furnace roofs will carry the castings through the final stages of heat-treatment, and thus a minimum of conveyor mechanism metal will pass through the heating and cooling zones. This conveyor arrangement has never before been attempted in such large-scale heat-treating.

Over and above the needs of tank production, it is claimed that the partnership of new cast alloys with more uniform and accurate heat-treatment will permit, in the future, considerable part elimination, design simplification and longer life of heavy metal products.

BISMUTH IN STAINLESS ALLOYS

The addition of small amounts of bismuth (0.1 to 0.5 per cent.) to the corrosion-resistant stainless alloys results, according to to H. PRAY, R. S. PEOPLES and F. W. FINK in a recent Paper to the American Society for Testing Materials, in a remarkable and useful increase in their machinability with no detriment to, and in some cases an improvement in, their corrosion resistance. The Paper describes laboratory data relative to the effect of bismuth on the machinability, corrosion resistance to a variety of media and conditions, physical properties at ordinary and high temperature, galling resistance and the hot-working properties of several of the more common stainless alloy types.

Recognising the benefits to be gained through improved machinability, the Alloy Casting Research Institute instructed Battelle Memorial Institute to study the problem with particular relation to castings, making it clear, however, that it was essential that improved machinability would only be acceptable if it were attained without material sacrifice in corrosion resistance or mechanical properties.

Laboratory tests and foundry experience of A.C.R.I. members lead to the conclusions that small bismuth additions to the cast corrosion-resistant chromium and chromium-nickel alloys with and without molybdenum, niobium, titanium, etc., materially improve their machinability, affect the mechanical properties important in corrosion-resistant service in no great extent, improve the galling resistance, do not injure weldability, and in general exert no deleterious effect upon corrosion resistance to any corrodant so far studied. In certain specific cases, corrosion resistance is somewhat improved.

The advantage of improved machinability is gained without sacrifice of the important properties of these corrosion-resistant castings. A similar condition probably holds for the wrought alloys, but these have not yet been exhaustively studied. The hot working of bismuth-containing 19-9 and 25-12 alloys, while feasible, must be carried out at somewhat lower than usual temperatures. The decreased ductility in short-time tension tests at 1,800 deg. F. indicates that care will be needed as to the type of applications to high-temperature service, but the maintained strength indicates that the load-carrying ability may be satisfactory. Because the pressing need for machinability is greater in the case of assemblies for corrosion resistance than in that of heat resistance, work to date has been concentrated on the former.

ALUMINIUM AND MAGNESIUM PLANS

American aluminium capacity is to be expanded to provide an output of 1,290,000 short tons by 1943, and magnesium capacity for a total production of 362,500 tons annually, states the W.P.B. Materials Division. This programme will assure aluminium for an aircraft production of 60,000 planes this year, and 125,000 next year. United States aluminium production was 308,000 tons in 1941. Present estimates indicate 1942 production in excess of 500,000 tons. In addition to primary aluminium, 200,000 tons of scrap aluminium will also be made available. For magnesium, facilities for 27,000 tons have been completed and substantial progress made on the remainder of the programme. Of the 200,000 ton programme now under construction, 176,000 tons will use the electrolytic process.

A CAST-IRON SOIL PIPE AND FITTINGS SUB-COMMITTEE of the Plumbing and Heating Industry Advisory Committee has been formed by the American War Production Board.

INDUSTRY AND E.P.T.

Planning for Post-War Trade

Making his Budget speech in the House of Commons last week, the Chancellor of the Exchequer said that it had been argued with much force that the 100 per cent. Excess Profits Tax prevented industry from making suitable provision out of its current profits for post-war reconstruction, and to meet this he made provision last year for a post-war credit of 20 per cent. to be given, subject to conditions to be determined by Parliament. It had since been represented that the attachment of conditions not yet clearly defined had robbed the proposal of its virtue in relation to reconstruction, for traders said that not knowing what the conditions might be, they could not plan ahead. He felt it would be wise to provide that this post-war credit, like the income-tax post-war credit of the individual taxpayer, would accrue by statutory right, subject only to its not being used for dividends or for the issue of bonus shares. So far as business and industrial problems were concerned, the President of the Board of Trade and himself, in consultation with the Paymaster-General (Sir W. Jowitt) would be prepared to begin discussions with and to receive suggestions from the associations and bodies concerned in relation to their post-war problems, with a view to making advance preparations for the difficulties of the post-war period.

Continued Control Essential

There was no justification in our general financial or economic situation for gloomy forebodings that were sometimes made in relation to our position after the war, said Sir Kingsley Wood. With a wise and statesmanlike policy we could release the pent-up demands which would exist at the end of the war at the appropriate rate to provide steady employment at a high level for several years to come. The restoration of our exports to a high level was, however, a necessary condition of success in these directions. One of the primary objectives of our post-war policy must therefore be the greatest possible expansion of international trade. If we were to overcome the difficulties and dangers of the post-war period we must regulate the pent-up demand and not allow it to be dissipated, as after the last war, in the wastage of an inflationary boom. The more one studied the likely post-war situation the more apparent it became that, for a variety of reasons, it would be entirely wrong to contemplate that the financial and economic controls which served our war effort could be swept away by a stroke of the pen at the conclusion of hostilities. We were on our guard against inflation during the war; even more must we be on our guard after the war, because there might be a natural, psychological reaction against a policy the need of which was easily understood in wartime, but which might not be so readily accepted after the war was finished. We must ensure that the fruits of success in war were not filched from us by any lack of appreciation of this important aspect of our post-war position.

NEWS IN BRIEF

ARRANGEMENTS are being completed between the liquidator of Irish Steel, Limited, and the Eire Ministry of Industry and Commerce for the resumption of work at Haulbowline Steel Mills, Cork Harbour. A new company is being formed.

THE EIRE MINISTER FOR SUPPLIES has made an Order fixing maximum prices for cast-iron scrap at £4 15s. per ton for heavy, and £3 15s. for light scrap in cupola sizes, when sold by *bona fide* scrap iron merchants, and 15s. per ton less when sold by other persons.

THE WEST WALES Tinplate and Steel Industries Permanent Committee is to send a deputation to the Board of Trade in connection with the Board's proposals to close down certain works and substitute Government war requirements. A sub-committee is preparing proposals to put before the Board.

INCREASED CONSUMPTION of nickel in 1941 was most marked in the United States, where it is estimated that over two-thirds of the entire world production was used during the year, as contrasted with an average annual consumption of about one-third in pre-war years. Production of nickel in 1941 reached a record figure.

FERROUS AND NON-FERROUS metal moulders who have not already received supplementary clothing coupons under earlier awards are entitled to 25 extra coupons under the new award reported in our last issue, 30 coupons if they are floor moulders. Employers who have not done so already should apply immediately to the local Labour Office.

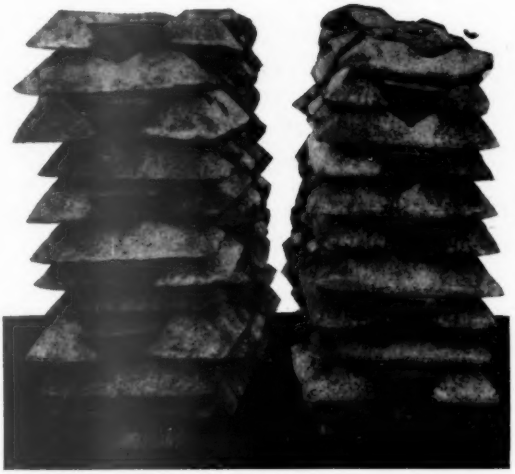
GEORGE COHEN, SONS & COMPANY, LIMITED, have purchased the whole of the railway track of the Clogher Valley Railway in Northern Ireland. There are 40 miles of track and sidings, and 3,500 tons of reusable rails, as well as over 70,000 sleepers, which will be made available for undertakings engaged on work of national importance.

THE AMALGAMATED ENGINEERING UNION, the Confederation of Shipbuilding and Engineering Unions, and the National Union of Foundry Workers have appointed a sub-committee to examine the question of creating an engineering joint trades movement. Owing to a long-standing difference in policy between the A.E.U. and the foundry workers on the one hand and the Confederation on the other, negotiations with the employers have so far been conducted separately.

MR. W. DODGSON, Divisional Officer of the Iron and Steel Trades Confederation, addressing a meeting of delegates of the Sheffield Joint Committee, suggested that steel and iron workers might answer the question whether they were contributing a 100 per cent. effort in war production. Mr. Dodgson said he was not making any charge of slacking, but it came of bad grace for workmen to point the finger of scorn at the management if they themselves were not straining every endeavour to secure 100 per cent. output.

STANTON

PIG IRONS *are* MACHINE CAST



The excellence of Stanton, Holwell and Rixons pig irons seemed to leave no room for improvement until Machine Casting came along. This method of manufacture eliminates sand, eliminates sows and produces a pig which is 100% iron and free from coarse graphite. It is clean working and economical of fuel in the cupola. Stanton Machine Cast Pigs have a shape which makes for easier handling and better stacking.

Specification

Weight	...	80—90 lbs.
Length	...	22 inches
Width	...	8½ inches
Thickness	...	3¾ inches
(at notch 2 inches)		

New shape
Better stacking

The chemical analysis and well-known physical properties of each brand remain unaltered.

A modern Pig for modern needs

THE STANTON IRONWORKS COMPANY LIMITED, NEAR NOTTINGHAM

PERSONAL

MR. H. B. T. WILDE has joined the board of Veritys, Limited, manufacturing electrical engineers, of Birmingham.

MR. A. M. BAER has been appointed a Joint Controller of Non-Ferrous Metals in place of Mr. J. C. Budd, who has resigned on grounds of health.

MR. E. A. GIMINGHAM has retired from the board of the Edison Swan Electric Company, Limited. He joined Sir Joseph Swan in Newcastle about 57 years ago.

DR. E. R. WALKER, M.Sc. (Eng.), has been elected chairman of the East Midlands Branch of the Institution of Mechanical Engineers. He is secretary of the local section of the Institute of British Foundrymen.

MR. T. WHEATLEY PRICE has been appointed works superintendent of Newton, Chambers & Company, Limited, chemical works, and Mr. J. Bradwell works manager of the central by-product recovery plant of Thorncliffe Coal Distillation, Limited. They succeed Mr. F. Hoyland and Mr. J. Sylvester respectively, who have retired after 52 years' service.

Wills

LEECH, HERBERT, managing director of the Pepper Mill Brass Foundry, Limited, Wigan	£23,248
CROSS, E. E., chairman of Cross Bros., Limited, iron, steel and metal merchants, Cardiff	£76,735
DEACON, MAURICE, formerly managing director of the Sheepbridge Coal & Iron Company, Limited...	£64,543
TYZACK, J. S., chairman and governing director of W. A. Tyzack & Company, Limited, steelmakers, etc., Sheffield	£102,005

OBITUARY

MR. JAMES S. GRIEG, a partner in the former Dundee engineering firm of Cooper & Greig, died recently.

MR. THOMAS MURRAY, sole partner in the firm of Thomson & Stewart, ironfounders, King Street, Aberdeen, died recently.

M. HUBERT E. MAYHEW, senior partner in Hubert E. Mayhew & Son, metal merchants, of London, died recently at the age of 64.

MR. CHARLES WOODLEY WYATT, a director of Wyatt Bros. (Whitchurch), Limited, hydraulic engineers, Whitchurch, Shropshire, has died at the age of 58.

MR. W. F. WHITWELL, a former president of the North of England Steel and Iron Manufacturers' Association and the Cleveland Ironmasters' Association, died last week, at the age of 73.

COL. RICHARD STEPHEN MURRAY-WHITE, D.S.O., managing director of British Timken S.A. (Pty.), Limited, roller bearing manufacturers, has died at Johannesburg in his 66th year.

MR. GEORGE FREDERICK SIMMS, the "father" of the chain and anchor trade, died recently at the age of 84. He was a director of N. Hingley & Sons, Limited, Netherton Ironworks, Dudley, and president of the Chain and Anchor Manufacturers' Association.

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Curran Steels, Hurman Street, Bute Docks, Cardiff—£10,000. J. and P. E. Curran.

Precision Engineers (Blackburn)—£2,000. J. N. Ansley and N. Leech, 28, Pleckgate Road, Blackburn.

Gypsum Company of Ireland (1942)—£10,000. J. R. Fisher, 136, Allcroft Road, London, N.W.5, subscriber.

L. D. Wood (Eldwood), Exhibition Grounds, Wembley, Mx.—General engineers. £10,000. L. D. Wood.

Sedlescombe Engineering Company, Coventry House, South Place, Moorgate, London, E.C.2—£5,000. R. Hill.

Mawer & Osborne, 1, Robin Hood Walk, Boston, Lincs—Ironfounders, etc. £1,000. H. Mawer and R. G. Osborne.

T. J. Voisey, Channon's Hill, Fishponds, Bristol—Machinery and metal merchants. £4,000. J. T. Voisey and A. M. Voisey.

France Harry & Company, 1,051-3, High Road, Whetstone, London, N.20—Engineers, tool makers, etc. £2,000. H. C. France, T. Harry, P. M. Hartley, and H. H. Jones.

DISTRIBUTION OF PISTONS AND CYLINDER LINERS

A system of controlled distribution is to be applied to pistons and cylinder liners for all internal-combustion engines and compressors of a bore size smaller than 6 in. This is the effect of a new scheme organised by the Ministry of Supply and affecting every civil user of such engines. The main purpose of this scheme is to ensure the most efficient and equitable distribution of pistons and cylinder liners. Only certain cylinder reconditioning specialists and recognised distributors to the motor trade will be authorised to hold and maintain stocks. Owners of engines engaged on work of national importance will, if necessary, be given Government assistance in obtaining these parts. Detailed instructions are being sent by the Ministry of Supply to the various trade organisations concerned for circulation to their members, and any additional information required may be obtained from the Regional Certifying Officers of the Ministry of War Transport.

IN RECOGNITION of 40 years' continuous office in the Boilermakers' Society, Mr. Mark Hodgson, general secretary, is to be presented with the Society's gold long-service medal.

METAL INDUSTRIES, LIMITED, has acquired over 90 per cent. of the issued ordinary share capital and the whole of the issued preference share capital of the Ingranic Electric Company, Limited, Bedford.

THE STREAM FLOWS *ON*

The stream of discovery and improvement flows on, despite the difficulties of the times. By laboratory experiment and practical trial, Workington are carrying forward researches into many aspects of improvements to their manufactures. Ultimately this work will prove of the greatest benefit to those who make use of Workington products.

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COMPANY NEWS

(Figures for previous year in brackets.)

Murex—Interim dividend of 7½% on the ordinary stock (same).

William Doxford—Interim dividend of 4% on the ordinary shares.

Craven Bros. (Manchester)—Final dividend of 10%, making 14% (same).

A. E. Jenks & Cattell—Interim dividend of 2½%, tax free (5%, tax free).

Bairds & Scottish Steel—Final ordinary dividend of 3% (5%), making 5% (8%).

Renold & Coventry Chain Company—Interim dividend of 3% on the ordinary shares (same).

Vulcan Foundry—Net profit for 1941, £31,178 (£29,528); dividend on the ordinary shares of 4% (3%).

Newey & Tayler—Income for 1941, £17,597 (£18,487); ordinary dividend of 10%; forward, £1,727 (£1,631).

Worthington-Simpson—Net profit for 1941, £17,065 (£20,279); ordinary dividend of 7% (same); forward, £27,325 (£22,799).

Range Boilers—Net profit for 1941, after tax, £11,881 (£11,631); ordinary dividend of 10% and a bonus of 5%, making 15% (same).

Sanbra—Net trading profit for 1941, after war damage insurance, £143,879 (£52,238); tax, £136,000 (£29,000); ordinary dividend of 7½% (nil).

Ideal Boilers & Radiators—Net profit, after taxation, depreciation, etc., £112,501 (£158,309); final ordinary tax-free dividend of 1s. per share, making 7½% (15%), free of tax.

Halesowen Steel—Net profit for 1941, after providing for taxation and contingencies, £20,096 (£20,052); final ordinary dividend of 17½%, making 25% (same); forward, £21,242 (£14,621).

A. A. Jones & Shipman—Profit for 1941, after tax and depreciation, £8,784 (£15,794); net profit, after note interest, war insurance, etc., £6,521 (£11,916); ordinary dividend of 10% (same); forward, £41,314 (£39,764).

A. Reyrolle—Profit for 1941, after depreciation and taxation, £160,340 (£169,471); to reserve, £50,000 (£60,000); dividend of 7% on the preference stock, £7,175; final dividend of 7½% on the ordinary stock, making 12½% (same); forward, £145,421 (£146,845).

Birmingham Small Arms—Profit on trading and income from investments to July 31, 1941, including trading results of the subsidiaries, after making reserves for E.P.T., N.D.C. and contingencies, £777,264 (£825,972); ordinary dividend of 7½% (same); forward, £278,249 (£301,065).

General Refractories—Trading profit of company and its subsidiaries for 1941, £185,115 (£189,436); interest charges, £12,498 (£14,626); depreciation, £40,777 (£40,784); A.R.P., £5,177 (£3,230); taxation, including E.P.T., £85,632 (£85,663); profits attributable to outside interests, £1,948 (£3,526); net profit attributable to General Refractories, £39,083, of which £39,079 (£41,225) has been included in that company's accounts; dividend, 5% (same); appropriated out of accumulated profits for war damage insurance, £4,650 (£4,000); to general reserve, £41,068 (nil); forward, £50,585 (£73,473).

NEW PATENTS

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

544,004 BRITISH IRON & STEEL CORPORATION, LIMITED, and MAYNE, J. E. O. Protecting metal surfaces against corrosion.

544,054 HOLMES, C. E. Furnaces, combustion chambers, and the like.

544,066 JOHNSON BRONZE COMPANY. Method of and apparatus for surfacing coated strip metal.

544,082 BIRMINGHAM ELECTRIC FURNACES, LIMITED, and KERFOOT, F. Salt baths for the heat-treatment of metals.

544,087 MITCHELL, F. G. Mountings for conveyor rollers.

544,112 FAIRWEATHER, H. G. C. (International Smelting & Refining Company). Method of melting copper.

544,114 HIGH DUTY ALLOYS, LIMITED, and HERON, J. A. Production of metal articles by extrusion.

NEW TRADE MARKS

The following applications to register trade marks appear in the "Trade Marks Journal":—

"MOLYCUT"—High-speed steel. THOS. FIRTH & JOHN BROWN, LIMITED, Savile Street, Sheffield.

"TUMOTIP"—Cutting tools. ALFRED HERBERT, LIMITED, Canal Road, Foleshill, Coventry, Warwicks.

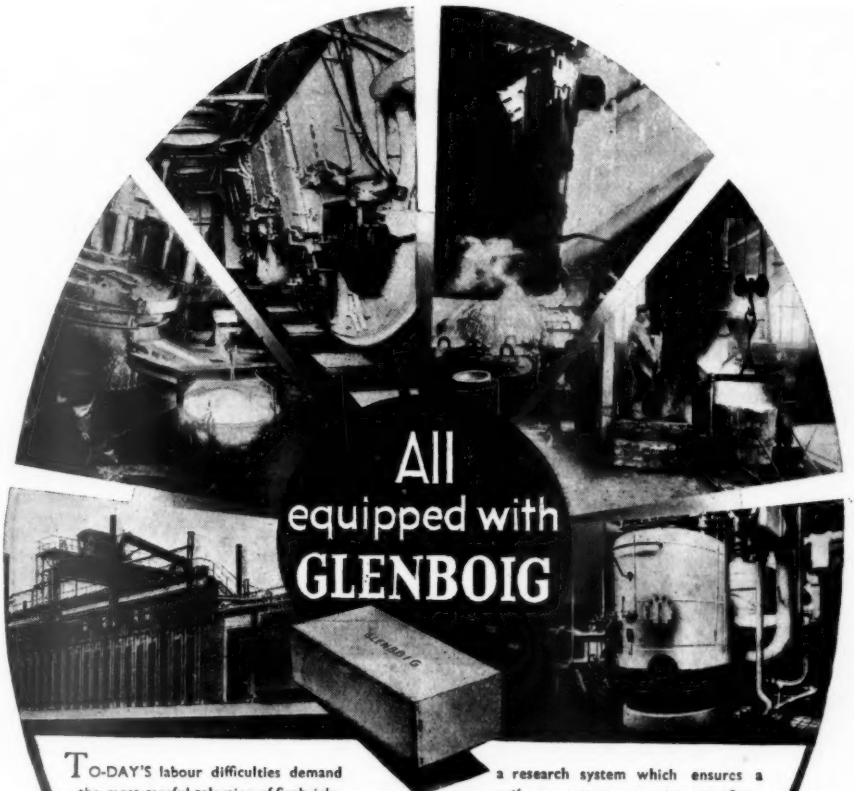
"E.C.C." (Device)—Electric arc-welding apparatus, etc. ELECTRIC CONSTRUCTION COMPANY, LIMITED, Lamport Hall, Northampton.

"GIRDEX"—Metal pressings and stampings, machine parts, etc. GIRDEX ENGINEERING COMPANY, LIMITED, Weston Lane, Tyseley, Birmingham, 11.

"KREGA"—Rolls, being parts of rolling mills. BRITISH ADAMITE ALLOY ROLL COMPANY, LIMITED, Netherton Ironworks, Holly Hall, near Dudley.

"THE APPLICATIONS of Statistics to Production Problems in Engineering" was discussed on April 22 by Mr. B. P. Dudding, of the research laboratories of the General Electric Company, Limited, at a joint meeting of the Manchester Association of Engineers and the Manchester Statistical Society.

NEW ENGLAND FOUNDRIES find that while cast iron has lost ground to steel in many products during recent years, it is now coming back. Certain instruments that formerly were built entirely of steel are now utilising cast-iron parts. This return to cast iron is also noted in the war designs for stoves, but it is not wholly a war measure. Some manufacturers, after extensive use of steel in these products, have found that cast-iron frames and legs with a steel shell are fully as good, if not in some cases more serviceable.



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GLENBOIG

Raw Material Markets

IRON AND STEEL

The resources of the iron and steel industry continue to be at the command of the Government, whose requirements account for almost the entire production. Ordinary civilian consumption has been practically eliminated, sanction being granted only for really important needs outside the war machine. The export trade also has virtually dried up; nor is there any possibility of a resumption of overseas business on a scale approaching pre-war levels until after the cessation of hostilities. The majority of ironfoundries are as busy as their capacity permits, but there are exceptions to be found, especially in the light-foundry industry. In this section the loss of export trade and the substantial decline in ordinary domestic business has not been offset to any extent by orders from Government departments, whose requirements of castings of the type produced by these concerns are within small dimensions. Some makers of light castings have been able to adapt their plant to cope with the production of heavier castings, and the result has been a steady influx of orders. Heavy engineering undertakings generally are kept in continuous operation by the insistent demands of the Government, and few are in a position to open their order-books to outside customers. Machine-tool manufacturers are fully employed and have heavy commitments, mostly for various branches of the Government.

Speciality engineers are large consumers of low- and medium-phosphorus irons and hematite in normal times, but supplies of these descriptions to-day are by no means plentiful and users are having to make do with alternative grades. Since conditions made it imperative to utilise substitute qualities of iron, there has been considerable development in this respect, and in numerous instances it has been found that satisfaction can be obtained by the incorporation in mixtures of high-phosphorus and refined irons and steel scrap. Ample quantities of high-phosphorus iron are available, this iron being made from ores found in the United Kingdom, whereas better qualities are manufactured from imported ores, shipments of which have had to be curtailed.

The steel industry is producing large tonnages of metal required for the manufacture of war material, and especially insistent is the demand for special and alloy steels, which are being used more and more extensively in the armament and munitions factories. Output of these grades is being stepped up as rapidly as possible. Makers of shipbuilding steels are kept very active and, in view of the expansion of the shipbuilding programme, may expect to be busy over a lengthy period. Plates, joists, angles, channels, etc., are moving away quite well and specifications are freer than they were a few months ago. There is no slackening in the demand for scrap iron and steel and, although deliveries have recently been better, there is urgent need for larger quantities to be made available.

NON-FERROUS METALS

Copper is perhaps the most important of the non-ferrous metals in the production of war materials, but tin, spelter and lead are also being consumed in large tonnages and distribution of all four metals is closely regulated by the authorities. There are ample supplies of copper to meet all essential needs, but every effort is being made to curtail usage of the metal and to achieve the maximum recovery of copper from scrap; in the latter respect, it is to be noted that more and more attention is now being paid to residues and brass skimmings, etc. In the United States, consumption of copper for other than really essential purposes is being restricted, and soon will be eliminated except for really important civil projects. For example, the War Production Board has placed a ban on all private building, except under licence from the Board, and this alone is bound to entail a large saving in the consumption of the metal, as, in 1940, 102,000 short tons of copper was used in the building trade, exclusive of electrical work, according to the American Bureau of Metal Statistics. At the same time, of course, there is certain to be some expansion of building to meet the requirements of the Government, but, nevertheless, this move is an indication of the way in which the American authorities are getting down to the task of conserving not only copper, but metals generally.

Economy in the use of tin is undoubtedly a matter of the utmost urgency, and already strenuous efforts have been made to eradicate all extravagant and wasteful consumption in the United Kingdom. Current supplies available to the United Nations are much lower than they were before Japanese military successes robbed the Allies of a large portion of their tinfields, and the new situation is one which calls for immediate consideration and action. It is true to say that supplies have been roughly halved during the past few months and, therefore, consumption must be adjusted accordingly. Tin stocks exist, but they, too, must be kept intact as far as possible, so that allocations to the various working-up industries will have to be further reduced if the needs of the war factories are to be met promptly and in full.

Non-war consumers of spelter are not getting anything like their normal deliveries of the metal and, in fact, allocations are being cut further, so that the future needs of Government departments may be assured. Since the beginning of this year supplies of lead have become much tighter; up to the end of 1941 deliveries were relatively easy to acquire, and the metal was used quite extensively as an alternative to others which were less freely available. Now, however, the authorities are restricting allocations to an appreciable extent, and only works operating on Government contracts can secure their full demands.

COX & DANKS, LIMITED, iron and steel scrap merchants, are opening shortly a new branch at Harlequin Avenue, Brentford, Middlesex.

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THE FOUNDRY TRADE JOURNAL

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Chairman : FitzHerbert Wright, The Butterley Company, Ripley, near Derby. Secretary : V. Delport, 2, Caxton Street, Westminster, S.W.1.

Participating Associations : National Ironfounding Employers' Federation ; British Ironfounders' Association ; National Association of Malleable Ironfounders ; Ironfounders' National Confederation ; British Bath Manufacturers' Association ; British Malleable Tube Fittings Association ; Cast Iron Chair Association ; Greensand Pipe Founders Association of Scotland ; Cast Iron Heating, Boiler, and Radiator Manufacturers' Association ; Cast Iron Segment Association ; National Ingot Mould Association ; Cast Iron Axlebox Association ; Institute of British Foundrymen (affiliated) ; British Cast Iron Research Association (affiliated) ; British Grit Association (affiliated) ; Agricultural Engineers' Association (affiliated).

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